

CONSERVATION PRACTICE STANDARD

ROOF RUNOFF STRUCTURE

(No.)

CODE 558

DEFINITION

Structures that collect, control, and transport precipitation from roofs.

PURPOSES

This practice may be applied as a part of a resource management system to support one or more of the following purposes:

- Improve water quality
- Reduce soil erosion
- Increase infiltration
- Protect structures
- Increase water quantity

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Roof runoff structures are a component of an overall resource management system.
- Roof runoff needs to be diverted away from structures or contaminated areas.
- There is a need to collect, control, and transport runoff from roofs to a stable outlet.
- Roof runoff is collected and used for other purposes.

CRITERIA

General Criteria Applicable To All Purposes

Design Capacity. At minimum, a 10-year frequency, 5-minute rainfall precipitation event shall be used to design roof runoff structures, except where excluding

roof runoff from manure management systems. In that case, a 25-year frequency, 5-minute precipitation event shall be used to design roof runoff structures (Refer to Agricultural Waste Management Field Handbook, NEH Part 651, Appendix 10B). When gutters are used, the capacity of the downspout(s) must equal or exceed the gutter flow rate.

Outlets. Runoff may empty into surface or underground outlets, or onto the ground surface. Surface and underground outlets shall be sized to ensure adequate design capacity and shall provide for clean-out as appropriate. When runoff from roofs empties onto the ground surface, a stable outlet shall be provided. When runoff is conveyed through a gutter and downspout system, an elbow and energy dissipation device shall be placed at the end of the downspout to provide a stable outlet and direct water away from the building.

Surface or ground outlets such as rock pads, rock filled trenches with subsurface drains, concrete and other erosion-resistant pads, or preformed channels may be used, particularly where snow and ice are a significant load component on roofs.

Supports. In regions where snow and ice will accumulate on roofs, guards and sufficient supports to withstand the anticipated design load shall be included.

Materials. Roof runoff structures shall be made of durable materials with a minimum design life of ten years. Roof gutters and downspouts may be made of aluminum, galvanized steel, wood, or plastic. Aluminum gutters and downspouts shall have a nominal thickness of 0.027 inches and 0.020 inches, respectively. Galvanized steel gutters and downspouts shall be at least 28 gauge. Wood shall be clear and free of knots. Wood may be redwood, cedar, or cypress. Plastics shall contain ultraviolet stabilizers. Dissimilar metals shall not be in contact with each other.

Rock-filled trenches and pads shall consist of poorly graded rock (all rock fragments approximately the same size) and be free of appreciable amounts of sand and/or soil particles. Crushed limestone shall not be used for backfill material unless it has been washed. Subsurface drains or outlets shall meet the material requirements of the applicable NRCS conservation practice standard.

Concrete appurtenances used shall meet the requirements of NRCS Construction Specification 32, Concrete for Minor Structures.

Protection. Roof runoff structures shall be protected from damage by livestock and equipment.

Additional Criteria To Increase Infiltration

Runoff shall be routed onto pervious landscaped areas (e.g., lawns, mass planting areas, infiltration trenches, and natural areas) to increase infiltration of runoff. These areas shall be capable of infiltrating the runoff in such a way that replenishes soil moisture without adversely affecting the desired plant species.

Additional Criteria To Protect Structures

Runoff shall be directed away from structure foundations to avoid wetness and hydraulic loading on the foundation.

On expansive soils or bedrock, downspout extensions shall be used to discharge runoff a minimum of five (5) feet from the structure.

The discharge area for runoff must slope away from the protected structure.

Additional Criteria To Increase Water Quantity

Structures needed to collect and store water from roofs for potable and non-potable purposes shall be designed and installed in accordance with sound engineering principles. Storage structures for non-potable purposes such as irrigation water should be designed in accordance with NRCS conservation practice standards, as appropriate.

Potable water storage structures should be constructed of materials and in a manner that will not increase the contamination of the stored water. Roof runoff collected and stored for potable uses must be treated prior to consumption and should be tested periodically to assure that adequate quality is maintained for human consumption.

CONSIDERATIONS

Avoid discharging outlets near wells or into structures that discharge directly into surface waters.

PLANS AND SPECIFICATIONS

Plans and specifications for installing roof runoff structures shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. The plans and specifications shall show the location, spacing, size, and grade of all gutters and downspouts and type and quality of material to be used. Plans and specifications for other practices essential to the proper functioning of the roof runoff structure, such as underground outlet, shall be included.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed that is consistent with the purposes of the practice, intended life, safety requirements, and the criteria for the design. The plan shall contain, but not be limited to, the following provisions:

- Keep roof runoff structures clean and free of obstructions that reduce flow.
- Make regular inspections and perform repair maintenance as needed to ensure proper functioning of the roof runoff structures.

CONSTRUCTION SPECIFICATION

558. ROOF RUNOFF STRUCTURE

1. SCOPE

This specification covers the fabrication, installation, and construction of roof runoff management facilities.

2. MATERIALS

ROOF GUTTERS AND DOWNSPOUTS shall be made of aluminum, galvanized steel, wood, or plastic, as required in Section 4. Aluminum gutters and downspouts shall have a nominal thickness of at least 0.07 and 0.05 cm, (0.027 and 0.020 in), respectively. Galvanized steel gutters and downspouts shall be at least 28 gage. Wood shall be clear and free of knots. Wood gutters shall be redwood, cedar, cypress, or pressure treated. Plastics shall contain ultraviolet stabilizers. Dissimilar metals shall not be in contact with each other.

GUTTER SUPPORTS shall have sufficient strength to withstand anticipated water, snow, and ice loads. Unless otherwise set forth in Section 4 or the drawings, supports shall comply with the following spacing requirements. They shall have a maximum spacing of 120 cm (48 in) for galvanized steel and 60 cm (24 in) for aluminum or plastic. Wood gutters shall be mounted on fascia boards using furring blocks that are a maximum of 60 cm (24 in) apart. Downspouts shall be securely fastened at the top and bottom with intermediate supports that are a maximum of 3 m (10 ft) apart.

DRAINFILL for driplines shall meet the requirements of PADOT Publication 408, Section 703, Type A, Coarse Aggregate, and the gradation shown on the drawings.

DRAINPIPE for subsurface drains shall meet the industry standards for the type of pipe required in Section 4 or on the drawings.

CHANNEL LININGS shall be adequately durable and erosion resistant to last the life of the other practice components, or as otherwise required in Section 4.

3. INSTALLATION

Gutters and driplines shall be installed at the locations and slopes shown on the plans. Gutter supports shall have a maximum spacing of 120 cm (48 in) for galvanized steel and 60 cm (24 in) for aluminum or plastic. Wood gutters shall be mounted on fascia boards using furring blocks that are a maximum of 60 cm (24 in) apart. Gutters shall be hung so that the outer edge of the gutter is below the projection of the roof line as shown on the drawings. Joints shall be made watertight with the use of mastics or by welding. Gutters shall be installed at the slope shown on the drawings or as set forth in Section 4.

Downspouts shall be securely fastened at the top and bottom, with intermediate supports that are a maximum of 3 m (10 ft) apart.

Flexible conduits in driplines shall be installed in accordance with ASTM F449.

Drainfill shall be placed in the dripline trench in such a manner so as not to be contaminated with adjacent soil. If required on the drawings or in Section 4, filter cloth may be used to envelop the bottom and sides of the drainfill.

Outlets for facilities shall be as shown on the drawings. Where downspouts empty directly onto the ground surface, there shall be an elbow to direct the flow away from the building, and splash blocks or other protection to prevent erosion. Downspouts shall not be outletted into foundation drains.

4. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:

DESIGN AND CONSTRUCTION CHECK DATA

558. ROOF RUNOFF STRUCTURE

Survey Record in Engineering Field Book

1. Freehand sketch of layout , including roof areas and slopes, outlets and downspouts.
2. Profile along the proposed centerline(s) of outlets and dripline drains.

Design Record

1. Capacity , gutter slope, and size requirements based on inflow from roof surfaces.
2. Plot of profile of ground surface and proposed grade of channels or drains, and outlets.

Construction Check in Engineering Field Book or Design Drawing

1. Measurements to show gutter, driplines, and appurtenances were installed as designed or as otherwise modified by the authorized personnel in the field.
2. Name of gutter manufacturer, product name, and material .
3. Length, kind, and size of gutters and downspouts.
4. Length, kind and size of outlet pipe.
5. Method of gutter supports.
6. Location sketch of lines and outlets as installed.
7. Gradation and quantity of stone in dripline drains.
8. Details of trash and/or animal guards, if installed.